NORTH TIPPAH VALLEY SEDIMENTATION SURVEY 1/

By

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ABSTRACT

A little more than one foot of modern sediment, derived from soil erosion since the country was settled, was found by borings on the flood plain of North Tippah Creek in 1939. Resurveys in 1969 show no further appreciable sediment accumulation. There has been further deposition in some places, but about an equal amount of erosion from other parts of the flood plain.

Lack of overbank sediment accumulation since 1939 suggests that the process had practically ceased by that date. The most likely explanation is reduced flooding following channel deepening in response to 1916 dredging of Tippah Creek, to which North Tippah is tributary. Subsequent extensive changes in land use, with reduced cultivation of steeper slopes and reforestation of eroded lands, and construction of many small dams, have undoubtedly

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reduced the rate of sediment delivery to the valley, but apparently not until after cessation of general flood plain aggradation.

After 1939 the stream channel apparently tended to fill until straightened in 1963. Subsequently it has been enlarged by erosion of the straightened channel, and headward erosion above the straightened reach. Channel erosion may now be the principal source of sediment production.

INTRODUCTION

Valley flood plain soils throughout north-central Mississippi have generally been covered with modern sediment, derived from soil erosion, since the country was settled about 1840. As early as 1860 the severe soil erosion and resulting valley sedimentation in northern Mississippi were described by the State Geologist (3).[3] Detailed studies of the sedimentation were begun by the Soil Conservation Service in 1935, and less detailed investigations were extended into more than 30 "sample" tributaries of the Yazoo drainage system in connection with the Department of Agriculture "Flood Surveys" (5). North Tippah valley was one of the sample areas selected for investigation.

North Tippah Creek drains about 24.28 square miles in Tippah County, north-eastern Mississippi (Figure 1).[4] At its

3/ Numbers in parentheses correspond with References Cited.

4/ Loose in folder.

mouth it joins with South Tippah Creek to form Tippah Creek, which is tributary to Little Tallahatchie River within the flood storage pool of Sardis Reservoir. The watershed is hilly and mostly wooded, although probably more than half has been cultivated at some time. It is underlain by unconsolidated Coastal Plain sandy and clay formations, of Eocene age, but the soils have developed largely from loess, or windblown silt, which mantles the hills in a layer a few feet thick.

Soil erosion has been severe where sloping lands have been cultivated. About 14 percent of the drainage area has been mapped as gullied land, so severely eroded that the original soil type can no longer be identified (1). In 1939 about 25 percent of the watershed consisted of cleared, sloping lands; although only about half were then in cultivation, most of the remainder - idle lands and pasture - probably had been cultivated at some time, and had suffered appreciable soil erosion. The soil erosion has produced large volumes of sediment, much of which has been deposited on valley flood plains comprising about 24 percent of the drainage area.

HISTORY OF INVESTIGATIONS

Sedimentation investigations in North Tippah Creek valley were begun in May 1939, as part of the Department of Agriculture survey of the Little Tallahatchie watershed. The investigation was made by ~~the~~ Soil Conservation Service personnel directed by Richard D. Holt, with technical advice from Gordon Rittenhouse of the Sedimentation Research Division. Measurements of sediment thickness were made mostly by L. O. Rowland, and F. E. Tardy was chief of a party which surveyed valley cross sections.

Auger borings were made along four valley cross sections, or ranges, to measure the thickness of modern sediment overlying the natural alluvial soil. The modern sediment, accumulated since clearing of the forest and cultivation of the land, is generally light brownish in color, more sandy than the underlying older alluvium and, where not mixed by cultivation, commonly stratified in thin horizontal layers. The underlying natural soil, developed on older alluvium, was distinguished by darker grayish color, uniform massive structure without visible sedimentary stratification, and firm soil concretions (called "buckshot") and lighter colors in the subsoil.

Valley cross-section ranges were marked at each end by bronze plates set in the top of concrete monuments. The monuments are about 6 inches square, with top about 6 inches above the ground.

Elevations, based on sea level datum, were established on the range monuments by leveling from existing government bench marks. Ground surface profiles, with elevations measured to the nearest tenth of a foot at intervals of not more than 20 feet, were surveyed along the range lines as a basis for computing sediment volume and for future resurveys.

In May 1969 the valley cross-sections were resurveyed by H. R. Turner, G. S. Stanford, K. L. Dalton, and S. C. Happ, from the USDA Sedimentation Laboratory of the Agricultural Research Service.

FLOOD PLAIN SEDIMENTATION

The 1939 borings indicated a little over one foot of modern sedimentation on the overbank flood plain, accumulated during about 100 years of accelerated soil erosion since the country was settled. There was no basis for measuring stream channel sedimentation in 1939, so the channel is not included in width of 1939 sediment listed in Table 1.

From 1939 to 1969 the data indicate a small amount of net sediment removal from the valley. Sediment accumulation did continue in many places on the flood plain, but it was approximately balanced by erosion or scouring on other parts, and channel enlargement resulted in net sediment removal from the valley.

Table 1.--Summary of data for North Tippah Valley sedimentation ranges

Range no.	1939 Overbank sediment			1939-1969 Sediment (Negative values represent net erosion)						
				Overbank			Channel	Flood plain including channel		
	Width (ft.)	Cross-section area (sq.ft.)	Av. thickness (ft.)	Width (ft.)	Cross-section area (sq.ft.)	Av. thickness (ft.)	Cross-section area (sq.ft.)	Width (ft.)	Cross-section area (sq.ft.)	Av. thickness (ft.)
NT-1	962	2063	2.14	1117	75	0.07	-160	1160	-85	-0.07
2	1450	2260	1.56	1529	150	0.10	140*	1596	290	0.18
3	2150	2425	1.13	2271	90	0.04	-40*	2330	50	0.02
4	2669	1835	0.69	2676	-548	-0.20	-237*	2789	-785	-0.28
Total	7231	8583	1.18	7593	-233	-0.03	-297	7808	-530	-0.07

* Includes spoil piles from 1963 dredging. For channel changes only, see Table 3.

The measured width of overbank sediment in 1969 was about 7 percent greater than recorded on the same ranges in 1939. The increase was chiefly in deposits bordering the valley sides where none was recognized in 1939. In some of those areas sediment was probably too thin for recognition by boring in 1939, especially where mixed with the old soil by cultivation. The increase in width does not appreciably change the computed average thickness.

Although little net sediment accumulation on the overbank flood plain is indicated between 1939 and 1969, the three upper ranges do show continued but much slower aggradation, averaging about 0.06 foot. That average is only about one-tenth of the indicated average for the same ranges during 100 years of accelerated soil erosion before 1939. The computed thicknesses, as shown in Table 1, appear less than could be measured reliably by the survey methods if sediment were distributed evenly along the range lines, but they are averages of measurable sedimentation in some places, and measurable erosion in other places.

Measurable deposition occurred principally in abandoned stream channels and some low swales, on natural levees bordering the stream channels, and on colluvial slopes bordering the valley sides. The new deposits ranged up to 2 feet in thickness, although exceeding half a foot in only a few places. They were approximately balanced by erosion or scouring elsewhere, mostly on higher parts of the flood plain but not generally on the natural levees bordering the stream. Scouring seldom exceeded half a foot in depth. Some of the deposits in lower areas may represent redistribution of material scoured from higher areas by overflow or local runoff waters.

Range 4 shows erosion across most of the flood plain surface, although the average was only 0.2 feet. More of this range is cultivated, suggesting that loosening of the soil by cultivation may cause surface erosion even on nearly flat flood plains.

In 1963 the channel was straightened by dredging from the mouth upstream to above Range 2. Spoil piles from dredging should have been approximately equal to the volume excavated, and they have been included in the cross-section data for the entire flood plain in Table 1, but not in the overbank sediment data. Of course the spoil is not uniformly distributed all along the channel, and the three sections are insufficient to provide a reliable average, but at Ranges 3 and 4 the spoil appears to be about average for those vicinities. At Range 2 there appears to be an unusual local concentration of spoil, exceeding the 1939-69 increase in channel cross section.

Channel Changes

North Tippah Creek evidently began to deepen or entrench its channel before 1939. The 1939 channel sections seem abnormally large at all four ranges, suggesting a general condition of trenching throughout most of the main stream and presumably also affecting at least the lower parts of tributaries. The most probable cause was the 1916 ditching of Tippah Creek in Tippah Drainage District No. 1, to which North Tippah is tributary. The lower half mile of North Tippah also was straightened. The shortening probably steepened the grade of North Tippah by at least several feet. That, together with the improved outlet through Tippah ditch, presumably induced erosion of the bed.

In 1940 the channel between Ranges 3 and 4 was described by L. O. Rowland as trenched 1½ to 2 feet into old gray alluvium exposed in the bed and banks. Probably there had also been comparable or greater erosion of the looser, more erodible, younger alluvium forming upper parts of the banks. More variable conditions were found farther upstream. Near Range 1 trenching of 1½ feet was reported, but there was 2 feet of loose sand in the bed and the channel appeared to be filling. At the bridge between Ranges 2 and 3 no trenching was recognized, but there was 1½ feet of loose sand in the bed. These differences may have reflected intervening local channel straightening, or other local variations. Trenching of a few feet might not be obvious in places where older alluvium was obscured by temporary channel deposits.

The channel changes since 1939 are summarized in Table 2, including effects of 1963 dredging plus subsequent erosion of the straightened channel and of the natural channel farther upstream. Channel widths and cross section areas are approximations because at most places it is impossible to identify precisely the channel limits, or top of bank, and data are thus somewhat subjective.

The 1963 dredging did not extend up to Range 1, but the channel there had been straightened prior to 1939. Since 1939 it has been deepened 5 feet. Apparently the deepening occurred mostly after 1963, and presumably reflects headward influence of the straightening and subsequent erosion below.

The relatively small change since 1939 at Range 2 probably reflects some prior enlargement there, perhaps related to local straightening about 1920, extending about three quarters of a mile upstream. It appears that the channel was locally abnormally wide in 1939, and has remained so. The slight (0.4 foot) rise in talweg elevation is not significant, apparently reflecting some minor local irregularity of the bed in 1939, for the channel bottom in 1969 was eroding in resistant, tight alluvium, covered only discontinuously with thin modern bed load sands.

At Range 4 the new artificial channel is more than 600 feet laterally from the old natural channel. Data for both channels are therefore shown separately in Table 2. The old channel now carries little water, but has filled only slightly.

Table 2.--North Tippah Creek channel data at sedimentation ranges.

Range No.	1939 Channel			1969 Channel			1939-69 Change In:		
	Width (ft.)	Thalweg elevation (ft.)	Cross section area (sq.ft.)	Width (ft.)	Thalweg elevation (ft.)	Cross section area (sq.ft.)	Width (ft.)	Thalweg elevation (ft.)	Cross section area (sq.ft.)
NT-1	30	448.1	195	42	444.1	355	+12	-4.0	+160
2	65	425.1	433	67	425.5	493	+ 2	+0.4	+ 60
3	48	400.9	318	59	399.5	570	+11	-1.4	+252
4	41	388.1	305	37*	388.1	265	- 4	0	- 40*
				76**	386.8	670	+35	-1.3	+365**

* Old natural channel, carrying only minor tributary flow since 1962.

** New artificial channel dug in 1963.

Cross sections measured before and after the 1963 dredging do not correspond with location of the valley ranges, so only approximate comparisons are possible (Table 3). Ranges 1, 2 and 4 deviate about 5, 15 and 10 degrees from normal to the channel, but their width and cross-section data, in Table 3, need be reduced by only 0.4, 3.5 and 1.5 percent, respectively, for comparison with the construction sections. In general, comparisons suggest some filling between 1939 and 1962 except at Range 1. No reliance can be placed on specific amounts shown by comparison of individual sections, but there is sufficient uniformity to suggest a general trend. Since the 1963 straightening there has been considerable widening, and a foot or more of deepening at the two lower ranges, and greater deepening at Range 1. At Range 2 the relations are obscure, because the channel apparently was locally abnormally wide in 1939, and it is doubtful whether available construction records provide valid comparison.

The dredged channel has been widened chiefly by sloughing of looser, more recent alluvium from upper parts of the banks, with little change in bottom width. Generally the bottom is cut into older alluvium which is tight, cohesive and quite resistant to erosion, but varies considerably in grain-size composition. Analyses of samples from the eroding stream bed at Ranges 1 and 4, listed in Table 4, illustrate the wide variation in proportions of sand and clay in the resistant material.

Table 3.--Comparison of North Tippah channel sections at sedimentation ranges with nearest sections taken just before and after 1963 channel straightening

Date	and location	Top width (ft.)	Bottom width (ft.)	Depth (ft.)	Cross section (sq.ft.)
1939	Range 1 (nr. Sta.344+00)	30	12	8.0	195
1961	Sta. 345+00	43	19	7.2	227
1964	Not surveyed-not dredged	-	-	-	-
1969	Range 1	42	8	13.0	355
1939	Range 2 (nr. Sta. 269+00)	65*	26	8.6	433
1961	Sta. 265+00	47	20	8.7	289
1963	Sta. 268+00, constr. stakes	51	14	8.6	229
1964	Sta. 265+00, As Built	36	20	9.6	272
1969	Range 2	67*	26	9.5	493
1939	Range 3 (nr. Sta.147+00)	47**	18**	10.0	318
1962	Sta. 151+50	32	13	7.4	143
1964	Sta. 150+00, As Built	49	28	10.5	403
1964	Sta. 145+00, As Built	48	28	9.2	420
1969	Range 3	59	27	12.1	570
1939	Range 4 (old channel)	41	27	10.1	305
1961-2	Not surveyed	-	-	-	-
1964	Sta. 55+00, As Built ***	54	32	10.5	445
1969	Range 4 (nr. Sta.54+00)***	76	26	11.4	670

* The greater channel width at Range 2, both in 1939 and 1969, makes it doubtful whether valid comparisons can be made with the nearest available sections taken just before and after channel straightening.

** Width only 37 and 8 feet according to survey notes, but comparison with 1969 survey suggests 10 feet error.

*** New channel.

Table 4.--Gradation of samples from resistant cohesive older alluvium in bed of North Tippah Creek.

Range	Coarse sand >0.500 mm. (%)	Medium sand 0.500-0.250 mm. (%)	Fine sand 0.250-0.125 mm. (%)	Very fine sand 0.125-0.063 mm. (%)	Silt 0.063-0.004 mm. (%)	Clay <0.004 mm. (%)	Organic matter By H_2O_2 (%)
NT-1	1.2	1.9	2.4	1.6	49.3	43.6	0.4
NT-4	1.2	10.2	37.6	10.6	20.2	20.2	0.3

The volume of channel erosion, since 1963 dredging, can be computed as 131 acre-feet, from comparison with "as built" sections near Ranges 1, 3 and 4. An apparent increase of 108 percent in cross-section at Range 2 is omitted from the computation because it seems abnormal and probably not representative. Volume computed from only 3 sections must be considered only a very rough approximation, yet it seems unlikely that the true volume would be more than 50 percent higher or lower. Within such limits even the rough figure may be significant, for it is half the computed average rate of sediment accumulation within the valley prior to 1939. If that relationship is true, the present rate of sediment output from the watershed may be a relatively large proportion of that in previous years of more active upland soil erosion. But resurveys of many more channel sections would be necessary to verify whether channel erosion is indeed of the magnitude suggested by present limited data.

VOLUME OF SEDIMENT

From the 1939 boring data a volume of 3941 acre-feet of modern sediment has been computed, as shown in Table 5. Flood plain areas were measured on the county soil survey map (1). Computations were made by the formula:

$$V = \frac{E_1}{W_1} + \frac{E_1 + E_2}{W_2 + W_2} + \frac{E_2}{W_2} \times \frac{A}{3}$$

in which V = Volume of sediment, in acre-feet

A = Area of sediment between ranges, in acres

E_1 and E_2 = Cross-sectional area of sediment at ranges upstream and downstream, in square feet

W_1 and W_2 = Width of sediment on ranges, in feet.

The computed volume represents only overbank sediment, as there was no way to measure sediment accumulation in the stream channels in 1939. It is impractical to delete channels from the flood plain areas measured on soil maps, so computations have been based on sediment depths derived for each range by dividing entire width of the flood plain (including width of channel) into the cross-sectional area of overbank sediment. This procedure does not fully discount the channel areas - which are increased by crookedness of the streams - and hence has a tendency to show an excessive volume. However, channel widths are not large enough to cause an error of more than one percent, which may well be less than unmeasured channel sediment.

Table 5.--Volume of modern sediment according to 1939 survey, North Tippah valley and tributaries

	Area (acres)		Sediment Volume (acre-feet)	
Above Range NT-1	355		492	
Linebarger Branch		162		224
Range NT-1 to NT-2	305		537	
Stave Mill Branch		76		89
Bowling Branch		123		122
Range NT-2 to NT-3	684		876	
Medlock Branch		460		393
Ishitubba		218		161
Range NT-3 to NT-4	820		727	
May Creek		335		198
Embry Creek		44		20
Below Range NT-4	150	___	102	___
Subtotal: Main Valley	2314		2734	
Subtotal: Tributaries		1418		1207
Total:		3732 acres		3941 acre feet

Minor tributary areas have been included with the areas of main valley segments; all together they amount to less than 10 percent of the main valley area. Volumes for principal tributaries, as shown in Table 5, have been computed from an assumed average thickness at the mouth equal to that on the nearest main valley range, or to the average for ranges above and below if they are about equidistant from the tributary mouth. In effect, the formula derives tributary volumes corresponding to two-thirds of the thickness assumed or computed at the mouth. This may produce too low a volume. In some other valleys, where modern flood plain sedimentation has been ~~thicker~~ greater, the greatest concentration has been found toward the head and the greatest thickness found in North Tippah valley was at the uppermost range. If sedimentation was indeed thicker farther upstream, and in tributaries, the volume of sediment in Table 5 for such areas might be as much as doubled. That would increase the total volume, for main valley and tributaries, by about 40 percent. However, random borings have not found greater thickness of sediment above Range 1 or in major tributary valleys, and the volumes listed in Table 5 are believed reasonable for the circumstances in North Tippah valley, on the basis of available data.

In 1939, about 11 percent less sediment was computed from the same boring data, but with smaller surface areas measured on airphotos[4] The greater areas shown by soil maps are chiefly in the heads of tributary valleys, where thin modern deposits may be difficult to distinguish and the hurried 1939 survey is believed to have been incomplete. It seems likely that all flood plain lands have received some modern sediment, and hence that all should be included in the computation.

The data do not indicate any appreciable net sediment accumulation since 1939. Computations show about 10 acre feet of net erosion from the overbank flood plain in the main valley, and twice as much sediment accumulation in tributary valleys. Such amounts are too small to be significant; they indicate only that sediment accumulation since 1939 has been too small for reliable measurement.

There has been some net erosion in the main valley because of channel enlargement following 1963 dredging, but complications introduced by the dredging prevent satisfactory computation of the erosion volume from present data. Spoil piles have been included with channel data in Table 1, and from those data a volume of 83 acre feet of net erosion, or removal, can be computed for the main valley. That figure is believed to be too low, however, because of apparently excessive spoil on Range 2; the true volume might be more than twice as great. Erosion has also been induced in the tributaries as a result of main stream ditching, but erosion on ranges in the main valley does not provide an adequate basis for estimates of erosion in tributary channels, which are undredged except the lower half mile of Medlock Branch.

Sediment is accumulating in at least 37 ponds, built since 1939. Probably they are trapping 75 percent or more of the sediment from their watersheds, which comprise about 3735 acres or 24 percent of the North Tippah drainage area, but there are no measurements of the pond sedimentation. Land use and erosion conditions have changed so much that sediment production undoubtedly has been greatly reduced, so that present sedimentation can not be estimated from the sedimentation rates prior to 1939.

INDICATED EROSION RATES

The modern sediment found in North Tippah valley in 1939 (computed as 3941 acre feet) was equivalent to erosion of an average of about 4 inches of soil from the tributary watershed, assuming upland soil and valley sediment to be of approximately the same weight. That amount of soil erosion is near the average indicated by valley sediments in 10 other Little Tallahatchie tributaries where sedimentation surveys were made. During about 100 years of soil erosion, it would be equivalent to an average sediment load of about 2000 p.p.m. (parts per million) if surface runoff were about 20 inches of water per year, as would be expected from regional runoff data (2).

Of course an unknown amount of sediment was carried on out of the North Tippah valley by the stream flow, and soil erosion surely exceeded 4 inches, but there are no data on the amount of sediment exported. The most nearly applicable data are from two dozen suspended load samples collected in 1939 from Tippah Creek some 20 miles below the mouth of North Tippah (4). The samples were collected at irregular times during periods of storm runoff, and had an average sediment concentration of about 400 p.p.m. There is, however, no adequate basis for judging how accurately they represented the average sediment load of Tippah Creek, or of North Tippah Creek which drains less than 7 percent of the Tippah Creek watershed and might differ considerably from the average for the larger area.

The rate of soil erosion appeared high in 1939, so the sediment load of North Tippah Creek should still have been near the 2000 p.p.m. minimum represented by the prior rate of flood plain aggradation. Since flood plain aggradation apparently had nearly ceased, however, the proportion of sediment being exported from the watershed should have exceeded the average for the preceding 100 years of soil erosion. Such reasoning suggests that the sediment contributed to Tippah Creek should have been of the order of 2000 p.p.m., in contrast to 400 p.p.m. measured downstream. Probably some sediment was being lost by overbank deposition in Tippah valley above the measuring station, but whether that was a major factor is not known. Thus the relationship between North Tippah and Tippah Creek suspended load is dubious, but at least the data do not suggest a 1939 rate of soil erosion greater than the apparent rate of flood plain deposition prior to 1939.

An additional part of the soil eroded from upper parts of the hillsides has been moved only to the lower parts of the same slopes. There is no present basis for estimating how much soil erosion is represented by such deposits low on the hillsides, but the total erosion has been greater than can be measured by sediment deposits plus sediment exported from North Tippah Creek.

Since 1939 there has been a great increase in the effectiveness of soil conservation practices, with reduced cultivation of slopes, increased vegetative ground cover, and extensive reforestation. Undoubtedly these changes in land use and agricultural practices have reduced the rate of upland soil erosion considerably. Also, at least 37 ponds have been built, almost all within the past 15 years, which probably trap and retain most of the sediment eroding from watersheds comprising about 24 percent of the entire North Tippah drainage area. The change has been so great that present erosion and sediment production rates can not be estimated reasonably from data on past sedimentation. Pond surveys ~~,~~ and suspended load sampling, and more channel resurveys, would be necessary to evaluate present erosion and sediment production rates.

CONCLUSION

There has been no appreciable net sediment accumulation in North Tippah valley since 1939, although a 1939 survey had shown about one foot of flood plain aggradation by sediment derived from soil erosion. Aggradation apparently stopped before sediment production was reduced by recent conservation programs and land use changes. The most likely explanation is that sediment accumulation ceased because of lesser overbank flooding following channel trenching induced by ditching. Sediment accumulation now appears to be chiefly in ponds, mostly built within the past 15 years, which receive drainage from about 24 percent of the watershed. Erosion of the straightened main channel, and tributaries, now appears to be the principal source of sediment production, possibly approaching half the [redacted] magnitude of upland soil erosion prior to 1939.

REFERENCES CITED

(1) Bright, William E., William I. Smith, Malcolm C. Tyer, W. L. Watts, R. C. Carter, H. S. Galberry and W. W. Nye.

1966. Soil Survey of Tippah County, Mississippi. Soil Survey Series 1963, No. 1., U. S. Dept. of Agriculture.

(2) Busby, Mark W.

1966. Annual runoff in the conterminous United States. Hydrologic Investigations Atlas HA-212. U. S. Geological Survey.

(3) Hilgard, Eugene W.

1860. Report on the geology and agriculture of the State of Mississippi. Jackson, Mississippi.

(4) Rittenhouse, Gordon.

1939. Sedimentation report, Tallahatchie Watershed Survey. Ms. in files of Soil Conservation Service.

(5) United States Congress.

1942. Survey of the Little Tallahatchie watershed in Mississippi. Letter from the Acting Secretary of Agriculture transmitting a report ---- 77th Cong., 2d Sess., House Doc. 892.

APPENDIX

North Tippah Creek Sedimentation Ranges, Tippah Co., Miss.

Location and Witness Marks

Range NT-1

In SE¼NE¼ Sec. 32 and SW¼NW¼ Sec. 33, T-3-S, R-3-E, about 135' below CL Antioch Road. Magnetic bearing S 57° E from R to L in 1969 (reported S 58° 15'E in 1939); azimuth 75° 45' R from W end of roof peak of barn north of hwy. on E side of valley.

Monument NT-1-R, bronze disk in concrete at Sta. 0+00, on Eugene Shelton land. TBM Xnails in SE side 16" hickory 25' N 26° W mag. Blazed 8" cherry 11.5' S 58° W. Monument elev. 457.33(1939); TBM 460.495(1969).

Capped 1½" iron pipe NT-1-RX at Sta. 0-16.7. TBM nail in S side 16" hickory 12.1' N 8° E mag. Blazed 10" hickory 2.0' N 31° W. Blazed 8" cherry 15' S 17° E. Elevation of pipe 460.885(1969).

Monument NT-1-L, bronze disk in concrete at Sta. 11+96.2, on Walter Shelton land. TBM Xnails in E side 12" & 17" double trunk sweet gum with old blaze, 6.5' S 83° W mag. Blazed 10" dogwood 26' S 13° E. Blazed 4" pine 33' S 37° E. Middle 11" trunk of triple sweet gum 11' S 74° E. Monument elev. 464.24(1969), 464.15(1939); TBM 464.08(1939).

Range NT-2

In N$\frac{1}{2}$SE$\frac{1}{4}$ Sec. 5 and NE$\frac{1}{4}$SW$\frac{1}{4}$ Sec. 4, T-4-S, R-3-E. Crosses North Tippah Creek ditch about 1400' N of S line of Sec. 5, and 50' S of mouth of Bowling Branch. Magnetic bearing N 86° 38' E from right to left in 1969 (reported N 86 E in 1939).

Monument NT-2-R, bronze disk set in concrete at Sta. 0+00, on Beard land. Paced 30' W to N-S fence line, 237' S to an E-W P/L fence; about 1800' W to public hwy. 51.6' N 50° W mag. to TBM nail in SW root of blazed 24" x 36" double trunk red oak on fence line. 3' S 10° W to dead 15" walnut stump; 2.5' N 27° W to 1/2" walnut sapling. Elevation of monument 447.475(1939); TBM: 446.44(1969).

Monument NT-2-L, bronze disk set in concrete at Sta. 17+42.6, on land of J. C. Street. TBM nail in root of 30" red oak 3.5 ft. N 8° E mag. Blazed 24" beech 42.6' S 83° E; both beech and red oak are at top of old eroded scarp bordering flood plain. Blazed 14" sycamore 38.6' N 26° E, on flood plain. Elevation of monument 435.08(1969); TBM 438.305(1969).

Range NT-3

In E½NE¼ and NE¼SE¼ Sec. 18, T-4-S, R-3-E. Crosses North Tippah ditch about 850' E of N-S hwy. Magnetic bearing S 7° 35' E, R to L (1969): reported S 9° E in 1939.

Monument NT-3-R, bronze disk set in concrete at Sta. 0+00 in pasture on Billy Simmons land. TBM nails in E root of 30" sweet gum ± 1/2 ft. W from range at Sta. 0+79, about 767' E of N-S hwy. Triple 12'-trunk sweet gum 70' S 63° W mag. 10" shagbark tree on E bank of small ditch paced 225' N 79° W. Old blaze on 24" cherry paced 147' N 34° W. 10" cherry paced 133' N 22° W. Triple 11"-trunk sycamore 70° S 26° E. Elevation of monument 417.94 (1939); TBM 414.91 (1969).

Monument NT-3-L, bronze disk set in concrete at Sta. 24+57.9 on Reese Stubbs land, in edge of woods. TBM Xnails in W root of 16" elm bearing 1939 blaze, 10' N 7° E, 3' upstream from Sta. 24+48. 1939 blazed 15" elm 46' N 64° E. Blazed 4" elm 3' S 11° W. Blazed 10" shagbark hickory 11½' S 20° W. About 800' E of N-S hwy. & 185' W of hedge row along fence line and field ditch. Elev. of monument: 415.03(1939); TBM 414.25 (1969 survey, adjusted to 1939 levels).

Range NT-4

In SE¼SW¼ Sec. 13; NE¼NW¼ & W½NE¼ Sec. 24, T-4-S, R-2-E, crossing straightened channel of North Tippah Creek about 2200' W of E line of Sec. 24.

Magnetic bearing N 40° 12' W, left to right, 1969. Reported bearing N 41° 30' W in 1939, perhaps not on exactly same line.

Original monument NT-4-R destroyed. Line reestablished 1969 from approximate recorded bearing, topography, and distance to ditch crossing.

Capped 1½" pipe NT-4-RX set 1969 at Sta. 2+33, at E-W fence line on Hines Graves land, about 350' W of Embry Creek and about 1,000' W of N 1/4 corner of Sec. 24. Blazed 14" water oak 27' S 60° W mag. Blazed 10" trunk of triple ash 13.7' S 34° E. Blazed 5" trunk of double hackberry 40' S 79° E. 18" hackberry 180' E on fence line. Elevation of pipe 400.325 (1969).

Monument NT-4-L at Sta. 30+67 on W. C. Childress land, 30' W of S end of small dam, about 215' N of E-W road along 1/4 section line. TBM Xnails in NW root of 11" pin oak 43.2' due E (mag.) along fence line. 32" red oak, 15' S of pond, 90' S 84° E. Blazed 7" cedar 28' S 78° W. Two large black gums 2½ ft. downstream from range, 78' from monument. Elevation of monument 407.175 (1939); TBM 409.625 (1969).